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Notes on Rosaceae—VII*

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ALCHEMILLA

In the North American Flora this genus is taken in a narrow sense, *i. e.*, as Linnaeus originally understood it. The genus *Aphanes* L., which was merged in *Alchemilla* by Scopoli, differs not only in the habit, being leafy-stemmed annuals, instead of scapose perennials with rootstocks, but the stamens are usually solitary, rarely more numerous, and opposite to one or more of the sepals, instead of being 4 and alternate with the sepals. The disk in the throat of the hypanthium, so characteristic of the typical Alchemillas, is almost obsolete in *Aphanes*.

The so-called Alchemillas of America are perennials, some of them in habit not so unlike the Old World species; but in all the stamens are only 2 and inserted on the inside of the disk instead of the outside, and the anthers extrorse instead of introrse. For these the subgeneric name *Lachemilla* of Focke was adopted, except for one species of exceptional habit, which was made into a distinct genus *Zygalchemilla*.

All the species of true *Alchemilla* have their home in Europe. Only five of them are either adventive or naturalized on this side of the Atlantic and all are confined to the northeastern corner of North America.

Alchemilla alpina L. ranges in America from Greenland to the island of Miquelon and the White Mountains of New Hampshire.

* These notes, continued from Bull. Torrey Club 38: 367 (1911), are supplementary to the monograph in volume 22 of the North American Flora.

[The BULLETIN for May (41: 265–318. *pl.* 7) was issued 29 My 1914.]

Alchemilla pratensis F. W. Smith and the three succeeding species are segregated from *A. vulgaris* L. *A. pratensis* has usually been known here under the name *A. vulgaris* and has become naturalized from Nova Scotia to Massachusetts.

Alchemilla Wichurae Buser has been collected only in East Greenland.

Alchemilla glomerulans Buser and *A. filicaulis* Buser range on this side of the Atlantic from Greenland to Labrador, and the latter has been collected also on Newfoundland.

APHANES

See remarks under *Alchemilla*. The true *Aphanes arvensis* L. has been collected in America in Nova Scotia, evidently there an introduced plant. The American plants, included in it or confused with it, have much smaller flowers, the hypanthium being only 1 mm. instead of nearly 2 mm. long. They were distinguished in the North American Flora as four species, differing in minor characters.

Aphanes australis Rydb. includes all specimens collected in the southeastern United States. It differs from those on the Pacific coast in the short ovate sepals, connivent in fruit. In the western species the sepals are lanceolate to ovate-lanceolate and ascending in fruit.

Aphanes macrosepala Rydb. differs in the elongated sepals, nearly as long as the densely pilose hypanthium.

Aphanes occidentalis (Nutt.) Rydb. and *A. cuneifolia* (Nutt.) Rydb. have short sepals and puberulent or glabrous hypanthium. They differ from each other in the form of the leaves.

LACHEMILLA

See remarks under *Alchemilla*.

Lachemilla orbiculata (R. & P.) Rydb. and *L. venusta* (Cham. & Schlecht.) Rydb. belong to a group in habit and leaf-form approaching the genus *Alchemilla*, but the plants are sarmentose. Both *Alchemilla orbiculata* R. & P. and *A. pectinata* HBK. have been recorded for Mexico and Central America. It is evident that the specimens labeled as either of the two constitute but one species. A closer examination of literature and specimens has revealed

that the two supposed species are identical, and that *Lachemilla orbiculata* ranges from Central Mexico to Bolivia.

The rest of the North American species except *L. ocreata* resemble *Aphanes* more strongly in habit and leaves, but they are all perennials.

Lachemilla procumbens (Rose) Rydb. is perhaps the most common of the Mexican species. Specimens of it are usually labeled *Alchemilla sibbaldiaefolia* HBK. Humboldt, Bonpland & Kunth's figure* shows that the original *A. sibbaldiaefolia* has different hypanthium, inflorescence and leaves, the latter in fact less like those of *Sibbaldia procumbens* than those of *L. procumbens* are.

Lachemilla domingensis (Urb.) Rydb. was based wholly on the description of *Alchemilla domingensis* Urb., no specimens of any *Lachemilla* having been seen from the West Indies at that time. Long after the publication of that part of the North American Flora containing *Lachemilla*, the first specimens were seen, but both the place in the key and the description were found to be correct and nothing needs to be added.

The following species were proposed as new: *Lachemilla Schiedeana* Rydb., *L. Pringlei* Rydb., *L. orizabensis* Rydb., and *L. Bourgeaui* Rydb. The first two were based in part on *Alchemilla hirsuta campestris* Cham. & Schlecht., which was described from a mixture.

Lachemilla ocreata (Donn. Smith) Rydb. is a very peculiar plant, apparently leafless, the leaves being reduced to connate imbricate sheaths, cleft into linear divisions. It is closely related to the South American *Alchemilla nivalis*.

ZYGALCHEMILLA

This genus was based on *Alchemilla pinnata* R. &. P., which has pinnate instead of palmately lobed leaves, as all the other species of the tribe have. This character, as well as the 3-nerved sepals and bractlets, constitutes the basis for the generic segregation. A rather interesting fact in its history may be recorded. Remy† described a supposed new species as *Alchemilla pinnata*, but finding that the name was preoccupied by *A. pinnata* R. &. P.,

* Nov. Gen. & Sp. 6: *pl. 561.*

† Ann. Sci. Nat. Bot. III. 6: 354. 1846.

he changed it to *A. achilleaefolia* Remy.* Remy's species was based on Dombey's plant from Peru, he overlooking the fact that this plant belonged to the original *A. pinnata* R. &. P. He, therefore, originally described the same plant under the same name, and consequently the second synonym was superfluous.

SANGUISORBA

In the North American Flora, the genus *Sanguisorba* was taken in its original narrower sense, *i. e.*, the perennial species with only 2–4 stamens, and 1 pistil with muricate papillose stigmas. Of this genus, four native North American and one introduced species, *S. officinalis* L., were recognized.

Sanguisorba canadensis L. is limited to the northeastern part of this continent. The plants referred to it from the northwest belong to the following two species.

Sanguisorba sitchensis C. A. Meyer [*S. latifolia* (Hook.) Coville] has white flowers. Piper in his Flora of Washington,† makes the following remark: "The red-flowered form of this species is referred by Howell to *S. officinalis* L. The white-flowered ordinary form was referred to *S. media* L. in Hooker's Flora." This statement is not correct. Hooker's *S. media* is described as having red flowers and is the same as *S. Menziesii* Rydb., described in the North American Flora. Howell's *S. officinalis* has, as stated, red flowers, but the filaments are but slightly exserted and filiform, not twice as long as the sepals nor dilated. It is the same as *S. microcephala* Presl.

POTERIDIUM

I believe that the genus *Poteridium* Spach should be reëstablished for the annual species of *Sanguisorba* with brush-like stigmas. The first species of this genus was originally described as *Poterium annuum* Nutt. in Hooker's Flora Boreali-Americana. Hooker adopted Nuttall's manuscript name, which the author had applied to the species growing in Arkansas and neighboring states, but the specimens treated in that flora belong to the Pacific coast species. Hooker's *Poterium annuum* is, therefore, a composite. The

* *L. c.* III. 8: 224. 1847.

† Contr. U. S. Nat. Herb. 11: 336. 1906.

question then arises, which of the two species should be called *Poteridium annuum*. As Nuttall himself afterwards in Torrey & Gray's Flora separated the two, and applied *Poterium annuum* to the eastern plant and *P. occidentalis* to the western one, it is best to apply the names in that way.

POTERIUM

This genus resembles *Sanguisorba* in habit, but the stamens in the staminate flowers are numerous and declined; the pistils are usually 2, and the stigmas brush-like. Linnaeus originally had two species in this genus, of which the first, *P. Sanguisorba*, for several reasons must be regarded as the type. To use *Poterium* for the second species, *P. spinosum* L., as Focke has done,* is not correct. For that genus the name *Sarcopoterium* Spach should be used.

ACAENA

This genus has been taken in its narrower sense, excluding the genus *Ancistrum*.

Acaena agrimonioides HBK. I have seen no specimens agreeing with the original description of this species. All specimens seen and so named belong to *A. elongata*. Bitter, in Bibliotheca Botanica,† cited it as a synonym and on page 324 he stated that it is "to be regarded as synonymous with *A. elongata*," but nowhere does he give any reason for so doing. In the original diagnosis of *A. agrimonioides*, the leaflets are described as being 8–10 lines (*i. e.*, 16–20 mm.) long, and the lower gradually smaller. In all specimens of *A. elongata* I have seen from Mexico the leaflets are rarely 15 mm. long and the lower pairs scarcely smaller than the upper. Although *A. agrimonioides* is unknown to me and my description in the North American Flora was drawn from the original Latin diagnosis, I can but regard it as distinct from *A. elongata*.

Acaena elongata L. Hemsley in his Biologia Centrali-Americana‡ admitted four species of *Acaena* to Mexico, viz. *A. agrimonioides* HBK., *A. elongata* L., *A. lappacea* R. &. P. and *A.*

* Engl. & Prantl, Nat. Pflanzenfam. 3^3: 45.

† 74: 28.

‡ 1: 378.

laevigata Vahl. Under *A. agrimonioides* HBK., he cited only Humboldt & Bonpland's specimens and hence held the same opinion of this species as I do.

In the North American Flora I have given my reasons for excluding *A. lappacea* and *A. laevigata* from the Mexican flora. There is no question regarding *A. laevigata* not being found there, neither is there in regard to *A. lappacea*, unless Bitter is correct in regarding it as a synonym of *A. elongata*. Against this speaks the fact that the typical *A. elongata* has not been found in Peru. In giving the distribution of *A. elongata*, Bitter gave "perhaps also in Peru," which shows that he had seen no specimens from that country. The typical *A. elongata* he described under the name *A. elongata gracilis* n. var. (an altogether unnecessary name), and this is limited by him to Mexico. It extends, however, through Central America to Colombia, but is not found as far south as Ecuador. Here it is represented by *A. elongata robusta* Bitter. If any form extends into Peru, it is this, which may be *A. lappacea*. My sincere opinion, however, is that *A. lappacea* was redescribed by Bitter under the name *A. torilicarpa* n. sp.

Acaena californica Bitter. The Californian species of *Acaena* has had a rather varied history. It was first treated by Hooker and Arnott in the Botany of Beechey's Voyage under the name *A. pinnatifida*, the authors supposing that it was the same as *A. pinnatifida* R. & P. of Peru. Torrey saw that it was not, but rather closer to *A. trifida* R. & P. and even listed it as such,* although it was not described under that name until twenty years later, in the Botany of California. For some years I have known that even this identification was erroneous, but have regarded it as the lost *Acaena tridactyla* Presl.† That author gives as the type locality "Mexico occidentale." As California at the time Haenke visited it was a part of Mexico, this interpretation does not seem out of place, and I still think it possible that it is not far from the truth. Bitter,‡ however, claimed that he had seen the type at Prague and identified it as the South American *A. trifida* R. & P. It is possible that Haenke, who also

* Pac. R. Rep. 4: 84. 1856.

† Epim. Bot. 201. 1849.

‡ Bibl. Bot. 74: 294.

collected in Chili and Peru, might have mislabeled the specimens. On the strength of this claim of Bitter's, I have reluctantly adopted his name *A. californica*. Bitter distinguishes not less than five varieties of this species. Anyone who knows the variability of the plant can see only individual variation in these varieties.

AGRIMONIA

Mr. Bicknell* in his paper on *Agrimonia* states:" Perhaps no one of our long-known plants has more effectually escaped a right understanding by botanists than the familiar Agrimony of the Eastern States, current in local floras and text-books as *Agrimonia Eupatoria* L." In fact, the genus as a whole was poorly understood here in America, before Mr. Bicknell took up the work on the same, and from the publication of his paper dates really our true conception of the species. It is strange, however, that this should have been the case, when Dr. Wallroth had presented a very good paper on the genus in 1842. It is true that most monographic work done in Europe on North American plants is rather poor and unreliable, and therefore we are liable to ignore such work done abroad. This might have been the reason why Wallroth's species have not been adopted. The writer took up most of Wallroth's names in the North American Flora. That Mr. Bicknell did not do so was unfortunate, as he will now not get the full credit for what his paper really was worth to us. The main reasons for his not taking up Wallroth's names were the following: (1) at that time the unfortunate Madison amendments to the Rochester Code were in force making older varietal names supplant specific names; (2) at that time the names proposed in Muhlenberg's Catalogue were generally regarded as properly published. In fact, most of them should be regarded as *nomina nuda*, for the adjectives added to these names evidently were not intended as descriptions, but as a part of the trivial or common name. If these two causes had not influenced Mr. Bicknell, I should not have had occasion to change his nomenclature except in one case, viz. *Agrimonia striata* Michx., which he had misunderstood. Even in this case, he was really not to blame. See below under that species.

* Bull. Torrey Club 23: 508. 1896.

Agrimonia gryposepala Wallr. This has gone under the name of *A. Eupatoria* L. ever since Pursh's time or perhaps even since Walter's time. In general habit and in the size of the fruit it approaches more the European *A. Eupatoria* than any other of our North American species; but the structure of the fruit and the flowers are different. See the key. It was first distinguished by Muhlenberg, who gave it the name *A. Eupatoria hirsuta* in his Catalogue in 1813, but, as stated before, without proper description. It was subsequently published under Muhlenberg's name by Torrey in his Flora, in 1824. The first specific name, however, is that of Wallroth in 1842. His is also the first really good and extensive description. He was the first one to point out the peculiar sepals and characteristic arrangement of the bristles of the fruit, which distinguish it from any other of the species of the United States. It is therefore very appropriate that his specific name is now restored. The specimens from California, Arizona, New Mexico, and Mexico are usually somewhat different, but no constant characters have been found on which to base a separation.

Agrimonia macrocarpa (Focke) Rydb. This is the only North American species which approaches *A. gryposepala* in the structure of the sepals and of the fruit. It differs, however, in the elongated hypanthium and the more copious pubescence. Focke made it a variety of *A. parviflora*, to which it has little relationship. The only characters in which it approaches that species are the form (not the number) of the leaflets and the coarse pubescence. The structure of the fruit and the flower and the number of the leaflets are not at all the same. Its range is limited to Guatemala, from where the following specimens have been seen:

GUATEMALA: Coban, 1907, *von Tuerckheim 1377;* Dept. Huehuetenango, 1896, *Seler 2594*.

Agrimonia rostellata Wallr. Muhlenberg was also the first one to distinguish this species and gave it in his Catalogue the name *A. Eupatoria glabra*, but without a proper description. De Candolle mistook it for *A. parviflora* Ait., probably because it has the smallest flowers of all our North American species. It has also the smallest fruit, which is different from the rest in that it is more rounded at the base and less grooved. Mr. Bicknell

adopted for this species the name *A. striata* Michx. See under that species, where the case is discussed in full.

Agrimonia microcarpa Wallroth. The first name for this species was *A. pumila* Muhl., printed in his Catalogue. The only thing said about this species beside the name is: "Small, Miss.," which means that the trivial name is small agrimony and that it grows in Mississippi. Now the only small agrimony growing in Mississippi is the present species and Mr. Bicknell evidently identified *Agrimonia pumila* Muhl. correctly. It had never been published under that name however, before Bicknell adopted it in his paper. There is no question that the species that Bicknell had in mind and that I now discuss is *A. pumila* Muhl. There is even more doubt that *A. microcarpa* Wallr. belongs to this plant. Wallroth cites three specimens: Pennsylvania (*Moser*), southern Georgia (*Beyrich*), and Jalapa (*Schiede*). As there is no indication of type, the first specimen should be regarded as such. I have seen no specimen of it from Pennsylvania, the nearest being from Maryland. In the former state it is represented by *A. platycarpa* Wallr. It is not likely that Wallroth should have confused the two species, as he is the author of both. Beyrich's plant undoubtedly belongs to *A. microcarpa* as here understood, but Schiede's plant from Jalapa, Mexico, belongs to *A. Pringlei*. The latter is glandular-granuliferous and must, therefore, be placed near *A. striata*. No one before Bicknell seems to have noticed the tuberous character of *A. microcarpa* and the other non-glandular species. This is not found in *A. Pringlei*.

Agrimonia platycarpa Wallr. This has not been recognized since Wallroth's time. It is closely related to *A. microcarpa*. In the latter the leaves are situated near the base of the stem, having either 3 leaflets of nearly the same size, or else also an additional much smaller pair below. In *A. platycarpa* the leaflets are 5 or 7 and the lower only slightly reduced. The fruit in *A. platycarpa* is broader than in *A. microcarpa*, usually broader than long, and with a more prominent flange or rim. Its range is more northern than that of *A. microcarpa*.

Agrimonia pubescens Wallr. This was first distinguished by Torrey & Gray under the name *Agrimonia Eupatoria mollis*. It was raised to specific rank by Britton,* following the Madison

* Bull. Torrey Club 19: 221. 1894.

amendment and well knowing the publication of *A. pubescens* Wallr., which he gives as a synonym.

Agrimonia Bicknellii (Kearney) Rydb. This was well described by Mr. Bicknell* as a variety of *A. mollis*, but without a varietal name. This was supplied a year later by Mr. Kearney. It is true that the characters separating *A. pubescens* (= *A. mollis*) and this species are not absolute and that intermediate forms are not lacking. *A. pubescens* is at home in the central states west of the Alleghenies, but extends east thereof into Virginia and Georgia. The home of *A. Bicknellii* is the Atlantic coast, but it is found as far west as Pennsylvania and Tennessee. In the Mississippi valley only *A. pubescens* is found and on the Atlantic border only typical *A. Bicknellii*. The intermediate forms are found in the Alleghenian region, where the ranges of the two overlap. These two species are the nearest American representatives of the European *A. Eupatoria*, but have much smaller fruit. Especially is *A. Bicknellii* sometimes hard to distinguish from *A. Eupatoria* without the fruit. Two western specimens in the United States National Herbarium I have determined doubtfully as *A. Bicknellii*, viz. one collected at Fort Snelling, Minnesota, by Mearns, and the other at Naperville, Illinois, by Umbach. They may belong to *A. Eupatoria* L.

Agrimonia Eupatoria L. Britton and Bicknell believed that this species was not found at all in America. No specimen has been seen from the East, where the species is most likely to be found introduced. There are, however, two specimens, one in the National Herbarium and one in the herbarium of the Missouri Botanical Garden, which without any doubt belong to the species. Holzinger's specimen, especially, has the fruit so well developed that there is no question of the identity. The specimens are:

MINNESOTA: Winona, 1889, *Holzinger*.

WISCONSIN: Mirror Lake, 1903, *Eggert*.

Agrimonia striata Michx. This species has been badly misunderstood. Probably the real cause of this is that in Michaux's herbarium there are two specimens on the sheet of *A. striata*. The left-hand specimen represents the plant, here treated under that name, and the right-hand specimen is one of *A. rostellata*.

* Bull. Torrey Club 23: 517. 1896.

One of the authors of Torrey & Gray's Flora, probably Dr. Gray, had seen this sheet, for they cite *A. striata* Michx. and appendage an exclamation point (!) after the same. They gave this as a synonym of their *A. Eupatoria parviflora*, which was based on *A. parviflora* DC., the same as *A. rostellata* Wallr. They also cite under this a specimen collected by Dr. Pitcher. This specimen is in the Torrey herbarium and belongs also to *A. rostellata*. This shows that Torrey and Gray regarded *A. striata* Michx. the same as what we now call *A. rostellata*. It was, therefore, not strange that Mr. Bicknell followed them, especially as one of the specimens in Michaux's herbarium belonged to that species. He, therefore, proposed a new name, *A. Brittoniana*, for the plant represented by the left-hand specimen in Michaux's herbarium and here treated under the name *A. striata*. By the courtesy of the Gray Herbarium we have received a print of a photograph of the type of *A. striata*, and this shows that the left-hand specimen is to be regarded as the type, not only bearing the name *Agrimonia striata* Michx., but also the word Canada on the labels. This is also the only species of the two which agrees with the description: "*fructibus . . . sulcato-striatis.*"

Agrimonia Pringlei Rydb. One specimen of this, as said before, was included in *A. microcarpa* by Wallroth. It is true that it resembles that species, *A. platycarpa*, and *A. rostellata* in habit and leaf-form, but not in pubescence nor in the roots. The leaves are glandular-granuliferous and more or less pubescent as they are in *A. striata*, and the roots are not tuberous-thickened. It is represented by the following specimens:

MEXICO, STATE OF VERA CRUZ: near Jalapa, 1903, *C. G. Pringle 11876;* Huatusco, 1841, *Liebmann 1637;* State of Vera Cruz, *Pringle 11830.*

Agrimonia parviflora Ait. This species has been the best understood of the North American species except *A. incisa*. It is true that in the beginning two additional names were given to it, *A. suaveolens* by Pursh, and *A. serrifolia* by Wallroth. The latter was probably led astray by De Candolle who had used the name *A. parviflora* for another species, viz. *A. rostellata*. Lately, Professor Urban* has proposed a new species, *A. polyphylla*. To me

* Symb. Ant. 7: 227. 1912.

this seems only a slender form of *A. parviflora*, grown under somewhat abnormal conditions. The specimens on which this new species were based extend the range of *A. parviflora* to Santo Domingo.

Agrimonia incisa T. &. G. No new facts were added in regard to this species in the North American Flora.

ADENOSTOMA

This genus has often been included in the Dryadeae, Sanguisorbeae, or Cercocarpeae. It could not very well be included in either the Dryadeae or the Cercocarpeae, as the ovules and seeds are inserted in the distal end of the ovary. It was placed in Cercocarpeae on account of its solitary achenes, but there are several other genera with solitary achenes that could not be placed in that tribe. In the characters of the fruit and hypanthium, it agrees best with the Sanguisorbeae, but the ovary is covered with a cushion, under the margin of which the style is inserted on one side and doubly bent; the species are shrubs of a peculiar habit with small entire linear leaves. It is, therefore, best to regard the genus as representing a distinct tribe.

Adenostoma fasciculatum H. & A. This species is very variable, and it is hard to decide if the next species should be merged in it or not. The leaves are either short or long, but usually distinctly petioled. The branches are glabrous or minutely puberulent, and in such cases approach the next species. *Adenostoma fasciculatum densifolium* Eastw. is in my opinion only a mere form of this species with more crowded leaves and inflorescence.

Adenostoma brevifolium Nutt. It was with some reluctance that I took up Nuttall's view regarding this plant. Usually, however, Nuttall had good reasons for his segregates, even if Torrey and Gray reduced many of them. Whatever value this plant may have as a species, the form is usually well marked by its short obtuse, subsessile leaves, and pubescent branches. S. Watson regarded it a variety of *A. fasciculatum*, and described it as var. *obtusifolium*. C. K. Schneider reduces the latter to a mere form, but describes a new variety under the name var. *hirsuta*. Whatever Schneider might have had in mind when he made the reduction, the fact is that his var. *hirsuta* is the same as the original *A. brevifolia* of Nuttall.

Adenostoma sparsifolium Torrey. This was originally described under the form "*A. sparsifolia.*" The name *Adenostoma* is, however, neuter. The species may perhaps represent a distinct genus as the throat of the hypanthium lacks the fleshy glands, characteristic of the type species.

COLEOGYNE

This genus was included in Cercocarpeae by Focke in Engler and Prantl's Pflanzenfamilien, but evidently erroneously so. The tribe Cercocarpeae in that work was a very unnatural one, composed of five genera. *Purshia* and *Chamaebatia* evidently belong to Dryadeae, notwithstanding their solitary carpels. *Adenostoma* and *Coleogyne* represent distinct tribes, which leaves *Cercocarpus* alone in the tribe. In *Coleogyne* the ovule and seeds are inserted at the distal end of the ovary and pendent, in Dryadeae and Cercocarpeae at the proximal end and erect or ascending. Furthermore, the pistil and the stamens in *Coleogyne* are separated by a tube equalling the stamens. The filaments are adnate to the base on the outside of this tube. Whether this tube represents a prolonged hypanthium or a set of abortive and united filaments, is hard to tell. The fact is that no such structure is found anywhere else in Rosaceae, but something similar is found in Capparidaceae. The fruit itself, however, is an achene, and hence very unlike the capparidaceous fruits. Another character abnormal to the Rosaceae is the opposite leaves and branches. The only other rosaceous genus, that I can remember, having opposite leaves is *Rhodotypus*.* The latter is so closely related to *Kerria* and in other respects typical, that no doubt can be entertained regarding its belonging to the family. It is not so with *Coleogyne*. Its peculiar flowers, its peculiar habit, more resembling Rhamnaceae, and opposite leaves and branches, etc., give rise to the question, may it not properly represent a new family?

WALDSTEINIA

Waldsteinia Doniana Tratt. Fifteen years ago Dr. Small distinguished from *W. fragarioides* a new species which he published

* Since the above was written Captain John Donnell Smith has described (Bot. Gaz. 57: 420. 1914) another abnormal genus with opposite leaves, viz. *Guamatela*.

under the name *W. parviflora*, the main difference being the smaller flowers. In looking up the illustrations of *W. fragarioides*, I found two plates that evidently illustrate *W. parviflora* instead of *W. fragarioides*. These were *plate 1567* in the Botanical Magazine and *plate 408* in the Botanical Cabinet. I also found that Trattinick had based his *Waldsteinia Doniana* on the former of these plates, which name therefore should supersede the later *W. parviflora* Small.

Waldsteinia lobata (Baldw.) T. & G. This species must be very local, for in the herbaria I have seen specimens from scarcely half a dozen localities, all in the mountains of Georgia and North Carolina. The achenes in this species are but 1 or 2.

Waldsteinia idahoensis Piper. This, like its eastern relative, is very local; in fact, it has been collected only at the type station, but may have a wider distribution, that region having been rather little botanized. The achenes are usually 2.

NEW YORK BOTANICAL GARDEN

The appearance of polar bodies in the spermogenous tissue of Ricciocarpus natans (L.) Corda

RUTH S. ATWELL

(WITH PLATE 8)

The presence of polar or centrosome-like bodies in spermogenous cells and their possible function and origin in the cell continues to be the subject of much discussion and interest among the cytologists working with Bryophyta. Such bodies have been noted by Ikeno (2) and Mottier (4) in *Marchantia* and regarded by them as true centrosomes. Lewis (3) observes them in *Riccia natans* L. (*Ricciocarpus natans* Corda) and in *Riccia crystallina* L. but does not regard them as true centrosomes since they arise *de novo* with each division. Miss Black (1) observes that the last division in the spermogenous tissue of *Riccia Frostii* Aust., the diagonal division, is accompanied sometimes by granules at the poles.

For this preliminary study of spermatogenesis in certain Hepaticae, *Ricciocarpus natans* (L.) Corda furnished the material from which slides were prepared and certain facts noted. These may be of interest by way of comparison or confirmation of the conclusions formed by workers in other related species. Material of *Ricciocarpus natans* was gathered near the Skokie Marsh, Cook County, Illinois, during June and July, 1913, and was fixed in chromic-osmic-acetic solution. The sections were stained with analin safranin and gentian violet. Occasionally orange G was also used. Deep staining followed by washing was necessary as it was difficult otherwise to differentiate the cytoplasmic structures.

As has been observed by others, it was noted that nearly all the stages of karyokinesis could be found in different segments of one of the nearly mature antheridia. All the cells of each segment, as marked off by the first divisions of the antheridium, contained nuclei in the same stage of development. Thus in large antheridia many successive stages of division were found. Fig. 2 shows such an antheridium.

In the earliest prophase of division noted, the chromatin seems to be arranged in a mass of irregular lumps, surrounded by a homogenous material which seems denser next to the nuclear membrane and which has a staining reaction quite similar to the surrounding cytoplasm; no nucleolus is distinguishable; the nuclear membrane is pronounced, the cytoplasm finely and evenly granular. FIG. 3 shows cells typical of this condition. Centrosome-like bodies appear in cells of younger antheridia as well as in older ones. They are also present in cells of both old and young antheridia during the earlier as well as the diagonal division. FIG. 1 shows a young antheridium in one of the segments of which these bodies were observed in connection with the three nuclei of that segment. One of these cells is drawn under higher magnification in FIG. 4. FIG. 6 represents these bodies in a cell of a much older antheridium when the spindle and nucleus are in a more advanced stage than in FIG. 4. The bodies are distinct and cannot be explained as granules appearing accidentally for they appeared quite constantly. They do not seem to be permanent organs as they arise and disappear with each new division.

The origin of these bodies was not taken up. However, their position at the poles and their direct connection with the spindle suggest that they may represent an important factor in the formation of the spindle. Lewis describes these bodies as first appearing at a little distance from the nuclear membrane which elongates as it approaches them. FIGS. 4 and 5 are typical, and show the bodies as entirely outside and free from the nuclear membrane. Kinoplasm is collected about and extending away from them in cap- or cone-like form outlining the spindle, which is apparently produced from the kinoplasm and consists of a few thick fibers converging at the poles. The bodies lie in the position of true centrosomes.

The chromosomes are formed from the central mass of nuclear material and become arranged in the nuclear plate. FIGS. 6 and 7 show them in this position during the diagonal division. They split and pass to the poles. The polar bodies are always present in this last division. No stages of anaphase were observed, probably due to the rapid change of the position of the chromosomes from the plate to the poles. FIG. 7 shows the chro-

mosomes splitting. Occasionally granules other than those appearing at the poles are observed in the cytoplasm, as shown in FIG. 5.

Mottier and Ikeno, who observed true centrosomes in plants, report that they are formed from a single body dividing in two. In these observations on *Ricciocarpus natans* the bodies seem to appear at once in the polar position with each new division. Whether or not they persist in the spermatid after the diagonal division and may later become blepharoplasts has been discussed by Black (1), Lewis (3), Wilson (5), Woodburn (6), and others. This study was not carried far enough to observe these late stages in *Ricciocarpus natans*.

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Explanation of plate 8

All drawings were made with the aid of a camera lucida. A Spencer microscope was used with apochromatic objectives, 1.5 mm. oil immersion, 3 mm., 16 mm., and compensating oculars 6 × and 12 ×. FIGS. 1 and 2 were drawn at stage level and all others at table level.

FIG. 1. Young antheridium. One segment showing three nuclei with polar bodies. × 1,600.

FIG. 2. Older antheridium. × 150.

FIG. 3. Two cells in early prophase. The chromatin of the nucleus is seen in an irregular mass. × 3,200.

FIG. 4. Cell from segment in FIG. 1, the chromatin in a central mass, the bodies at the poles with kinoplasm extending from them outlining the spindle. × 3,200.

FIG. 5. Cell from an older antheridium. The chromatin is in an early spireme form and the spindle is more fully developed. × 3,200.

FIG. 6. The oblique spindle with chromosomes in equatorial plate, the spindle fibers terminating in the polar bodies. × 3,200.

FIG. 7. Similar to FIG. 6, the chromosomes splitting. × 3,200.

Slope exposure as a factor in the distribution of Pseudotsuga taxifolia in arid parts of Washington

GÖTE TURESSON

It is a well-known fact that the vegetation on hills and mountain slopes differs according to the exposure of the locality to different quarters of the compass. A flora of mainly xerophytic character inhabits the south-facing slope, while the northern declivity, less exposed to insolation, is covered with a more or less mesophytic vegetation. Also the southwest and southeast slopes are generally occupied by a xerophytic flora, the northeast and northwest by a mesophytic.

The great differences in the distribution of plant-communities as well as individuals due to variations in insolation may be seen in every part of the world. Warming (10, 11) tells us how in Greenland the southern slopes of a mountain chain may have an open xerophytic vegetation "appearing as if burnt up," while the northern slopes are at the same time covered by a dense, green, mossy carpet, with many flowering plants. The same may be observed in the Mediterranean countries, and even in the proximity of the equator we find a marked distinction between the flora of the northern and southern slopes.

But slope exposure is an important factor not only in the determining of different types of vegetation over wide areas; it also affects the vegetation within a very limited area. Giltay (3) has shown how a great difference may exist between the temperature and atmospheric humidity on the northern and southern slopes respectively of the sand-dunes in Holland, even when only a few paces apart. More recently Stenström (4) investigated the difference in the flora of the embankments of railways, showing how some plants occupy the southern embankment, others the northern, etc.

While studying the influence of slope exposure upon the distribution of the various plants on the banks of Spokane River in eastern Washington the writer's attention was particularly directed

to the behavior of *Pseudotsuga taxifolia*, popularly known as Douglas spruce. The range of this conifer is extensive. It is found most luxuriant in the Vancouver strip, reaching perhaps its highest development in the Puget Sound region (see also Sudworth, 9). This region, falling within the limits of Merriam's Humid Transition area (5), is notable for its moist climate favoring a luxuriant growth of dense forests, almost exclusively composed of Douglas spruce, which here assumes gigantic dimensions. Less conspicuous and never attaining the development it reaches in the Vancouver strip, it reappears in the extreme eastern part of Washington and in northern Idaho where the climatic conditions approach those of the coast region. The main distribution of the tree in this region seems to coincide with the Canadian Zone of Merriam.

Abundance of moisture in atmosphere and soil seems to be of vital importance to the growth of Douglas spruce. It is therefore surprising to find this conifer occupying the drier parts of eastern Washington, Merriam's Arid Transition area. Realizing the scanty rainfall—about 18 inches in Spokane—it may well be questioned how the tree is able to endure the extremities to which Humid Transition plants are submitted in this arid region. The problem loses some of its complexity when it is found that Douglas spruce in this region always occupies the shady northern slope of hills and ridges, and is entirely absent on the southern, thus affording a most notable example of the effect of slope exposure. Nowhere is this more beautifully shown than on the banks of Spokane River in the vicinity of Spokane. The banks, composed of glacial detritus, sometimes attain a height of 50 meters, and the vegetation of the sunny south-facing bank is in striking contrast with that of the more shady north-facing bank. This latter is occupied by a pure growth of *Pseudotsuga taxifolia*. A small belt of *Populus trichocarpa*, *Alnus tenuifolia*, *Cornus stolonifera* and *Salix Scouleriana* fringes the edge of the river. The following herbs are common in this belt:

*Artemisia ludoviciana**	*Aster foliaceus frondeus*
Aster Douglasii	*Aster laevis Geyeri*

* In questions of nomenclature Piper's Flora of the State of Washington (6) is followed.

Aster oreganus
Heracleum lanatum
Impatiens biflora
Mentha canadensis borealis
Roripa Nasturtium
Scutellaria lateriflora
Senecio hydrophilus
Solanum Dulcamara
Stachys palustris
Steironema ciliatum

Higher up on the steep slope, where *Pseudotsuga* becomes dominant, the vegetation shows the following composition:

TREES

Pseudotsuga taxifolia

SHRUBS

Ceanothus sanguineus
Opulaster pauciflorus
Sambucus glauca
Schizonotus discolor
Spiraea corymbosa

HERBS

Antennaria rosea
Arnica cordifolia
Campanula rotundifolia
Castilleja miniata
Claytonia linearis
Claytonia perfoliata
Claytonia sibirica
Collinsia tenella
Crepis barbigera
Crepis gracilis
Disporum majus
Dodecatheon puberulum
Drymocallis Convallaria
Erigeron speciosus
Erythronium grandiflorum
Fragaria platypetala
Galium Aparine
Galium boreale
Gentiana oregana
Geranium viscossisimum
Heuchera cylindrica
Hieracium albiflorum
Hieracium Scouleri
Mertensia olbongifolia
Pentstemon confertus
Ranunculus glaberrimus
Sedum stenopetalum
Sieversia ciliata
Silene Douglasii multicaulis
Synthyris rubra
Tellima parviflora
Tellima tenella
Trillium petiolatum
Vagnera amplexicaulis
Valerianella macrocera
Vicia americana
Viola adunca
Viola retroscabra

As easily seen, the herbaceous vegetation is made up of truly Transition or Arid Transition plants with one exception, *Claytonia*

perfoliata, a Humid Transition plant here having an isolated station. The formation is of a somewhat open character, but in deeper shade the ground is generally covered by a continuous mat of mosses. Epiphytic lichens are common. On the steep declivity no humus has been able to accumulate, and it is only on the lower part of the bank that a rather thick layer of humus is to be found, owing its existence to the mass of dead matter which is in continuous downward motion.

The opposite south-facing bank has a very different flora; in fact, the contrast is so striking as to make it seem almost unnatural. The heavily *Pseudotsuga*-forested north-facing slope faces a vegetation on the opposite bank, which in xerophily rivals the desert flora! The greater part of the bank is devoid of trees. *Populus trichocarpa* fringes the edge of the river, but *Alnus tenuifolia* has disappeared. Shrubs of quite different kind from those in the corresponding belt of the northern bank form the undergrowth. The shrubs are:

Amelanchier florida
Clematis hirsutissima
Prunus demissa
Ribes aureum

The dominant herbs at the water-edge are:

Artemisia ludoviciana
Asclepias mexicana
Aster laevis Geyeri
Aster oregana
Coleosanthus grandiflorus
Euthamia grandiflora
Steironema ciliatum

The declivity proper has two very marked belts, a lower closed formation, and an upper and open formation, the difference being largely due to the obvious fact that the lower zone is more sheltered against insolation and drying winds than is the upper. A continuous turf of various grasses covers the lower belt, and many of the plants recorded in the list from the northern slope reappear in this relatively sheltered zone. More or less dominant are the following additional:

Apocynum androsaemifolium
Astragalus Purshii
Delphinium Menziesii
Erysimum asperum
Lomatium triternatum
Sphaeralcea rivularis

The most remarkable feature of this zone, however, is the

abundance of shrubs. They do not form thickets, but are scattered widely apart over the area. In some cases, however, one of them, *Berberis repens*, may form a pure growth of some extent. The stratum of shrubs is composed of:

Amelanchier Cusickii
Berberis repens
Crataegus brevispina
Philadelphus Lewisii
Rhus Toxicodendron

The remaining part of the bank, the upper zone, is by far the most interesting one. As said before, no continuous turf of vegetation is found, only scattered individuals often several feet apart. The intense insolation and the exceedingly dry winds which are so common in eastern Washington in the summer months must be considered as the chief causes for this scanty xerophytic vegetation. Another factor, which may play some part in the difficulty of establishing a closed formation, is the mobility of the substratum. Owing to the steepness of the bank, gravel is rapidly moving downward. Many plants which probably are able to withstand the strong insolation are unable to get a foothold, thus giving room to other plants more adapted to the moving substratum, but poor in the formation of a continuous turf. That many of these plants show a high degree of adaptation to the habitat is evident from the fact that they do not occur outside of these south-exposed banks. The formation, which includes many of the most decorative and at the same time the rarest plants in Spokane Valley, shows a composition of the following nature:

SHRUBS

Ramona incana
Rhus glabra occidentalis

HERBS

Allocarya hispidula
Carduus undulatus
Chaenactis Douglasii
Collomia grandiflora
*Cuscuta californica**
Eriogonum compositum
Eriogonum heracleoides
Eriogonum niveum
Eriophyllum lanatum
Cilia aggregata
Lappula ciliata
Lithospermum ruderale
Lomatium Grayi
Lupinus Piperi

* Infesting *Scutellaria grandiflora*.

Machaeranthera canescens	*Phacelia heterophylla*
Mentzelia laevicaulis	*Physaria Geyeri*
Mentzelia integrifolia	*Ptiloria exigua*
Oreocarya sericea	*Scutellaria grandiflora*

The vegetation of the upper belt of the south-exposed bank, as recorded in the above list, corresponds closely to the Upper Sonoran flora, to follow Merriam's terminology. In Washington the Upper Sonoran life area is confined to the interior southern part of the State with a rainfall less than 10 inches. However, many of the Upper Sonoran plants follow the valley of Columbia River and its tributaries, and extend far up in the Arid Transition Area. Through the valley of Okanogan River they even reach British Columbia. The warm and sunny south-facing slope of the river banks is well fitted to support this vegetation of a more southern character. They all exhibit xerophily, protecting them from desiccation. A well-developed coating of hair is the most common means of protection, reaching an extreme development in such forms as *Eriogonum niveum* and *Eriophyllum lanatum*, which have a thick felt on leaves as well as stem. One of the forms included in the above list is of more than common interest, namely, *Physaria Geyeri*. This beautiful crucifer is known to occur only in the upper region of Spokane Valley, here usually occupying the southern river banks. The dense coating of hair is apparently a very effective means for depressing transpiration, but it also constitutes, in connection with the cushion-like and tufted character of the plant, a method of protection against the low winter temperature. Flowering in the latter part of April and the whole month of May, reflorescence very often takes place in August, and this reflorescence lasts often through all winter. A few hours of sunshine even in the most severe winter months, December and January, is enough to induce it to open its yellow flowers.

Where the slope terminates upwards and level ground commences this characteristic flora ceases abruptly, and the dry *Pinus ponderosa* forest with its scanty undergrowth takes its place. In some places where the slope is gentle it merges into the flora of the gravelly prairie dominated by *Balsamorhiza sagittata* and *Gaillardia aristata*.

From the above we find how profoundly slope exposure in-

fluences, and how it determines, the kind of vegetation present. Coming back to *Pseudotsuga taxifolia* the evidences have showed that exposure is the regulating factor in the distribution of the tree in this region, the northern slopes and ridges being the only localities which offer the needed humidity in soil and atmosphere. Not only around Spokane but in all more or less arid regions can this be observed. Piper (6) cites the example of Kamiak Butte, a granitic cone in the arid region of eastern Washington projecting about 500 meters above the surrounding basalt, having its entire south exposure covered by a bunchgrass flora, while the northern slope is densely timbered with yellow pine and other coniferous trees (including *Pseudotsuga taxifolia*). Even in regions with a higher amount of annual precipitation, as in the extreme eastern part of the State and in northern Idaho, we find *Pseudotsuga* by far better developed on the northern exposure, though lacking in the more moist situations, not being able to compete successfully with *Thuja plicata*, which here becomes dominant. At a higher altitude, mainly in the Canadian zone, it again becomes the dominant tree on the northern slopes, while *Pinus contorta* often becomes the most conspicuous on the southern exposure. Watson (12) describes a similar case from north central New Mexico, in which region *Pseudotsuga taxifolia* covers the north-facing slopes above 8,000 feet (the Canadian Zone) and extends down in the narrow canyons to about 7000 feet.

Turning now our attention to the distribution of *Pseudotsuga taxifolia* in the dry regions of western Washington, we find it growing in the San Juan Islands. These islands, situated between the Strait of Juan de Fuca and the Strait of Georgia, are remarkable for their dry climate and for the many Arid Transition plants which there have been able to get a foothold, since the climatic conditions resemble those in eastern Washington. The nature of the climatic conditions may best be illustrated by mentioning that the only cactus which occurs in the Vancouver strip, *Opuntia polyacantha borealis*, is confined to one of these islands. Other truly Arid Transition plants are also found, for instance *Sieversia ciliata*, *Polemonium micranthum*, *Lupinus microcarpus* and *Juniperus scopulorum*. The problem is a somewhat puzzling one, and Piper (6, p. 44) remarks: "Only one physical factor

presents itself which may explain these strange cases, namely, the fact that these islands lie in the lee of the Olympic Mountains and therefore have a lesser rainfall. The conditions, therefore, more nearly approximate those of the Arid Transition area than any other portion of Washington west of the Cascade Mountains." It is not surprising to find *Pseudotsuga taxifolia* confined to the northern slopes of the hills in these islands; in fact, a different behavior would be hard to understand, since it is here submitted to practically the same climatic conditions as in other arid regions of its range, where it, as has been shown, always occupies the northern declivity as a result of the effect of slope exposure.

Rigg (7) has in an interesting paper, dealing with the forest distribution in these islands, pointed out the seemingly peculiar distribution of *Pseudotsuga taxifolia* as limited to the north-facing slopes of the hills. He is inclined to attribute to the soil the difference in the forest distribution. Upon investigation of the soil on the barren south-facing slope and on the forested north-facing, it was shown that the soil on the barren portion was black and powdery, containing a good deal of gravel, while the forested portion was everywhere covered with two feet or more of yellow clay, containing occasional irregular fragments of rock.

It is hard to believe that the chemical nature of the different soils should cause the difference in the forest distribution, but as darker soil is more readily and strongly heated than is that of lighter color, this character may in a subordinate way have some influence (see Falk, 2; Schimper, 8; Warming, 11). When we on the other hand know how profoundly slope exposure affects the distribution of *Pseudotsuga taxifolia* in regions with similar climatic conditions to those in the San Juan Islands, the determining factor is presumably the same.

Cowles (1) no doubt is right when stating that a species in general can grow in a large number of formations at its center of distribution, since there the climatic condition favors it most highly. In other regions, especially near its areal limits, it can grow only in those formations which resemble most closely in an edaphic way the climatic feature at the distribution center. We have found how *Pseudotsuga taxifolia* when growing under conditions not favorable to its development always establishes itself

on north-facing slopes and banks, and thus secures the greatest possible amount of atmospheric and telluric moisture.

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INDEX TO AMERICAN BOTANICAL LITERATURE

1912–1914

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

Reviews, and papers that relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

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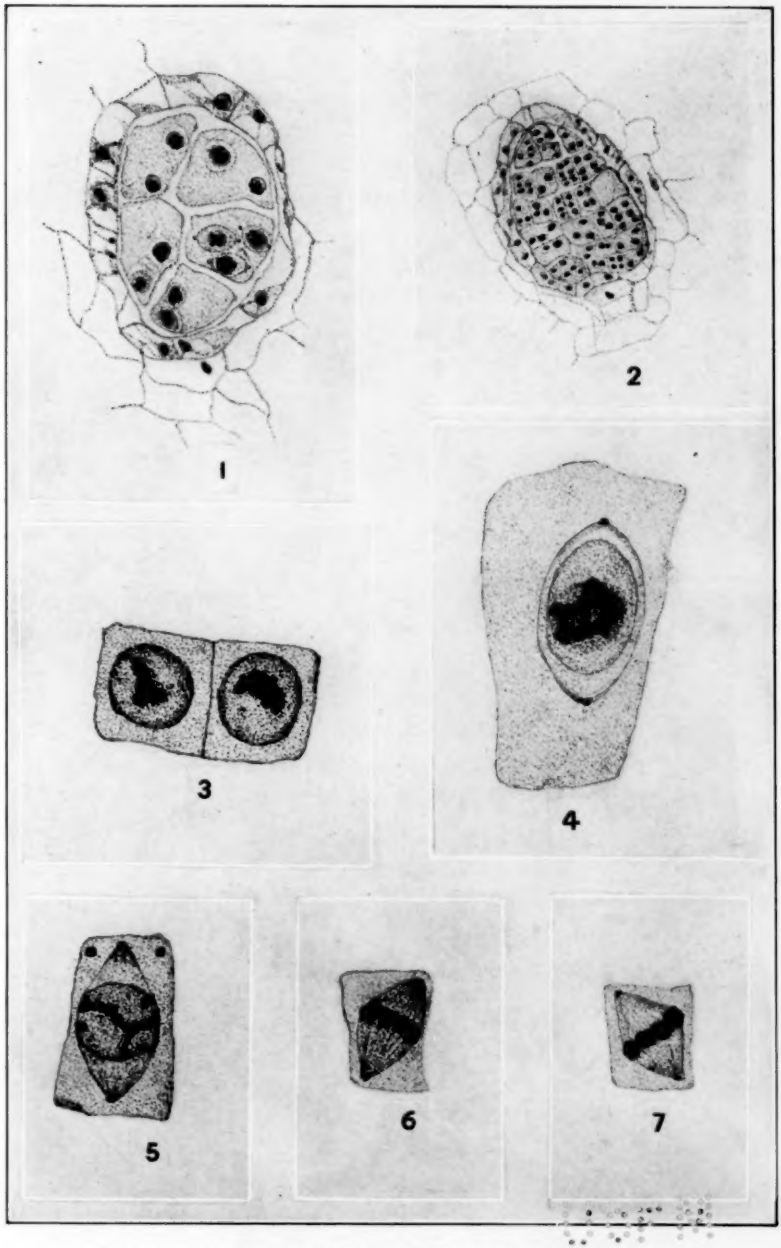

ATWELL: POLAR BODIES IN RICCIOCARPUS NATANS